

MARK 5 MEMO #029

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To: Mark 5 Development Group

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Subject: DBE performance vs number of FIR and interpolator taps.

The effect of reducing the number of taps in the FIR filter of the polyphase filter bank is primarily a reduction in the useable bandwidth of each channel as a result of the degraded shape factor. On the other hand reducing the number of taps in the interpolator Reduced the inband image rejection. In memo #18 Hans and I suggested 16 taps per sub filter for the PFB and 16 taps per sub filter for the PFB and 16 taps for the interpolator. Figure 1 shows the performance of the PFB in “mode 3” with 15 32 MHz channels. (Channel 0 is lost due to aliasing – see memo #18). The colors indicate the filter function and the black show the strength of the aliased images. The following table lists the performance as a function of the number of taps.

#PFB taps	# Interpol taps	Correlation loss %
16	16	0.5
8	16	1.3
8	8	1.5
8	4	3
4	4	5
2	2	30

The overall sensitivity loss of the PFB is the sum of the correlation loss from the table above plus the loss of 1 out of 16 channels (3.2%) plus a small added loss due to the filter shape function which narrows the effective bandwidth and results in another approximately 1%.

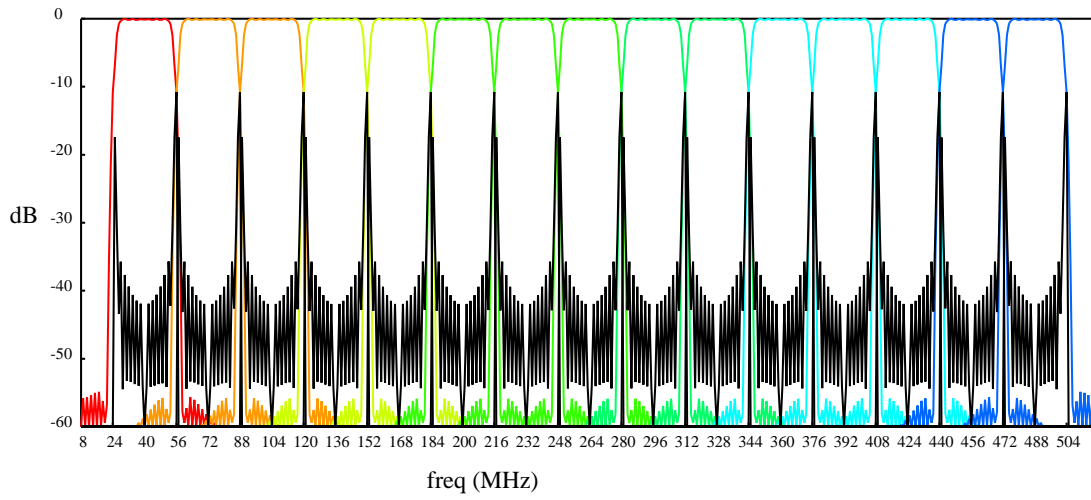


Fig 1. PFB with 16 taps per PFB filter and 16 taps per interpolation filter.

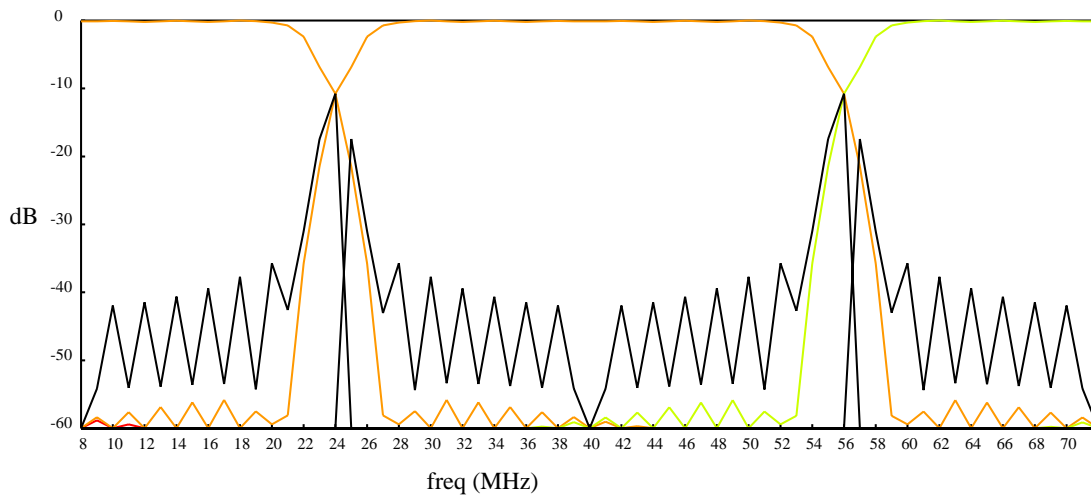


Fig 2. Expanded view of PFB response shown in Fig 1.

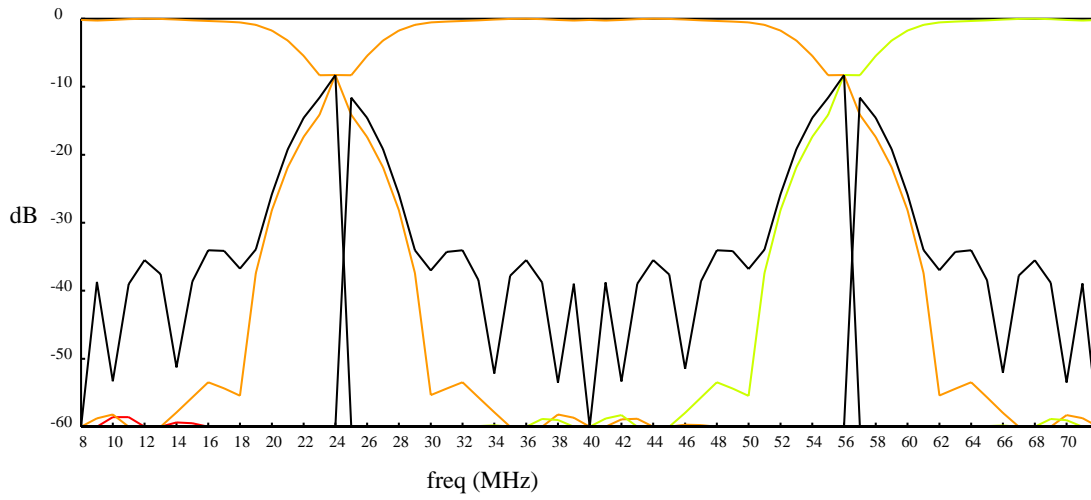


Fig 3. Expanded view of PFB response with 8 taps per PFB subfilter and 8 taps per interpolation filter.